Assignment -3

Problem Statement :- Build CNN Model for Classification Of Flowers

Assignment Date	10 OCTOBER 2022
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Maximum Marks	2 Marks

Question-1:

Download the Dataset : Dataset

Solution:

Question-2:

Image Augmentation

Solution:

Image Augmentation

```
[7]  import cv2
```

```
[8]  import matplotlib.pyplot as plt
     import numpy as np
```

```
[9]  %matplotlib inline
```

```
[51] image = cv2.imread('/content/drive/MyDrive/Flower1/flowers/rose/5234278003_d827fcd73b_m.jpg')
     height,width = image.shape[:2]
     resized_image=cv2.resize(image, (3*width,3*height),interpolation=cv2.INTER_CUBIC)
```

```
[52] fig= plt.gcf()

     fig.set_size_inches(18,10)
     #fig.axis("off")
     plt.imshow(cv2.cvtColor(resized_image, cv2.COLOR_BGR2RGB))
     plt.show()
```

+ Code + Text

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```
[12] #pip install Augmentor

[13] pip install imgaug

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Requirement already satisfied: imgaug in /usr/local/lib/python3.7/dist-packages (0.4.0)
Requirement already satisfied: Pillow in /usr/local/lib/python3.7/dist-packages (from imgaug) (7.1.2)
Requirement already satisfied: Shapely in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.8.4)
Requirement already satisfied: six in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.15.0)
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/dist-packages (from imgaug) (4.6.0.66)
Requirement already satisfied: numpy>=1.15 in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.21.6)
Requirement already satisfied: scipy in /usr/local/lib/python3.7/dist-packages (from imgaug) (1.7.3)
Requirement already satisfied: scikit-image>=0.14.2 in /usr/local/lib/python3.7/dist-packages (from imgaug) (0.18.3)
Requirement already satisfied: imageio in /usr/local/lib/python3.7/dist-packages (from imgaug) (2.9.0)
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/dist-packages (from imgaug) (3.2.2)
Requirement already satisfied: PyWavelets>=1.1.1 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (1.3.0)
Requirement already satisfied: tifffile>=2019.7.26 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (2021.11.2)
Requirement already satisfied: networkx>=2.0 in /usr/local/lib/python3.7/dist-packages (from scikit-image>=0.14.2->imgaug) (2.6.3)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (1.4.4)
Requirement already satisfied: pyparsing!=2.0.4,!=2.1.2,!=2.1.6,>=2.0.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (3.0.9
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (0.11.0)
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/dist-packages (from matplotlib->imgaug) (2.8.2)
Requirement already satisfied: typing-extensions in /usr/local/lib/python3.7/dist-packages (from kiwisolver>=1.0.1->matplotlib->imgaug) (4.1.1)

[14] pip install ipyplot

Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/
Collecting ipyplot
  Downloading ipyplot-1.1.1-py3-none-any.whl (13 kB)
Requirement already satisfied: numpy in /usr/local/lib/python3.7/dist-packages (from ipyplot) (1.21.6)
Collecting shortuuid
  Downloading shortuuid-1.0.9-py3-none-any.whl (9.4 kB)
Requirement already satisfied: IPython in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.9.0)
Requirement already satisfied: pillow in /usr/local/lib/python3.7/dist-packages (from ipyplot) (7.1.2)
Requirement already satisfied: traitlets>=4.2 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (5.1.1)
Requirement already satisfied: pygments in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.6.1)
Requirement already satisfied: setuptools>=18.5 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (57.4.0)
Requirement already satisfied: decorator in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.4.2)
Requirement already satisfied: backcall in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.2.0)
Requirement already satisfied: pexpect in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (4.8.0)
Requirement already satisfied: pickleshare in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (0.7.5)
Collecting jedi>=0.10
  Downloading jedi-0.18.1-py2.py3-none-any.whl (1.6 MB)
     |████████████████████████████████| 1.6 MB 14.3 MB/s
Requirement already satisfied: prompt-toolkit<2.1.0,>=2.0.0 in /usr/local/lib/python3.7/dist-packages (from IPython->ipyplot) (2.0.10)
Requirement already satisfied: parso<0.9.0,>=0.8.0 in /usr/local/lib/python3.7/dist-packages (from jedi>=0.10->IPython->ipyplot) (0.8.3)
Requirement already satisfied: six>=1.9.0 in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot)
Requirement already satisfied: wcwidth in /usr/local/lib/python3.7/dist-packages (from prompt-toolkit<2.1.0,>=2.0.0->IPython->ipyplot) (0.
Requirement already satisfied: ptyprocess>=0.5 in /usr/local/lib/python3.7/dist-packages (from pexpect->IPython->ipyplot) (0.7.0)
Installing collected packages: jedi, shortuuid, ipyplot
Successfully installed ipyplot-1.1.1 jedi-0.18.1 shortuuid-1.0.9
```

Question-3:

Create Model

Solution:

Create Model

```
[15] import imageio
     import ipyplot
     import imgaug as ia
     import imgaug.augmenters as iaa

          WARNING! Google Colab Environment detected!
          You might encounter issues while running in Google Colab environment.
          If images are not displaying properly please try setting `force_b64` param to `True`.

[53] input_img = imageio.imread('/content/drive/MyDrive/Flower1/flowers/rose/102501987_3cdb8e5394_n.jpg')

[54] hflip= iaa.Fliplr(p=1.0)
     input_hf= hflip.augment_image(input_img)

[55] vflip= iaa.Flipud(p=1.0)
     input_vf= vflip.augment_image(input_img)
```

```
images_list=[input_img, input_hf, input_vf]
labels = ['Original', 'Horizontally flipped', 'Vertically flipped']
ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

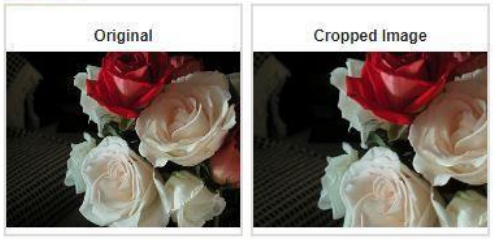
show html


```
[56] rot1 = iaa.Affine(rotate=(-30,30))
     input_rot1 = rot1.augment_image(input_img)
     images_list=[input_img, input_rot1]
     labels = ['Original', 'Rotated Image']
     ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

show html


```
crop1 = iaa.Crop(percent=(0, 0.3))
input_crop1 = crop1.augment_image(input_img)
images_list=[input_img, input_crop1]
labels = ['Original', 'Cropped Image']
ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

show html




```
[58] noise=iaa.AdditiveGaussianNoise(10,40)
     input_noise=noise.augment_image(input_img)
     images_list=[input_img, input_noise]
     labels = ['Original', 'Gaussian Noise Image']
     ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

show html

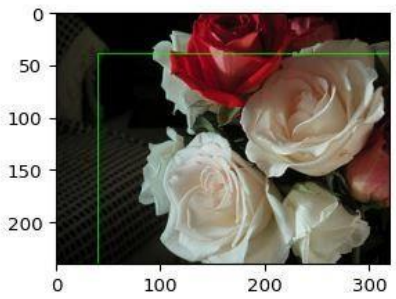

```
[59] shear = iaa.Affine(shear=(-40,40))
     input_shear=shear.augment_image(input_img)
     images_list=[input_img, input_shear]
     labels = ['Original', 'Image Shearing']
     ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

show html


```
[60] contrast=iaa.GammaContrast((0.5, 2.0))
     contrast_sig = iaa.SigmoidContrast(gain=(5, 10), cutoff=(0.4, 0.6))
     contrast_lin = iaa.LinearContrast((0.6, 0.4))
     input_contrast = contrast.augment_image(input_img)
     sigmoid_contrast = contrast_sig.augment_image(input_img)
     linear_contrast = contrast_lin.augment_image(input_img)
     images_list=[input_img, input_contrast,sigmoid_contrast,linear_contrast]
     labels = ['Original', 'Gamma Contrast','SigmoidContrast','LinearContrast']
     ipyplot.plot_images(images_list,labels=labels,img_width=180)
```

show html


```
[61] from imgaug.augmentables.bbs import BoundingBox, BoundingBoxesOnImage
     bbs = BoundingBoxesOnImage([
      BoundingBox(x1=40, x2=550, y1=40, y2=780)
     ], shape=input_img.shape)
     ia.imshow(bbs.draw_on_image(input_img))
```



Question-4:

Add Layers (Convolution,MaxPooling,Flatten,Dense-(Hidden Layers),Output)

Solution:

```
Add layers(Convolution,Maxpooling,Flatten,Dense-(hidden layer),output)

[62] from tensorflow.keras.datasets import mnist
     from tensorflow.keras.models import Sequential
     from tensorflow.keras.layers import Conv2D
     from tensorflow.keras.layers import MaxPool2D
     from tensorflow.keras.layers import Flatten
     from tensorflow.keras.layers import Dropout
     from tensorflow.keras.layers import Dense

[38] (X_train,y_train) , (X_test,y_test)=mnist.load_data()

     Downloading data from https://storage.googleapis.com/tensorflow/tf-keras-datasets/mnist.npz
     11493376/11490434 [==============================] - 0s 0us/step
     11501568/11490434 [==============================] - 0s 0us/step

[39] X_train = X_train.reshape((X_train.shape[0], X_train.shape[1], X_train.shape[2], 1))
     X_test = X_test.reshape((X_test.shape[0],X_test.shape[1],X_test.shape[2],1))

[40] print(X_train.shape)
     print(X_test.shape)

     (60000, 28, 28, 1)
```

```
print(X_train.shape)
print(X_test.shape)

(60000, 28, 28, 1)
(10000, 28, 28, 1)
```

```
[41] X_train=X_train/255
     X_test=X_test/255

[42] model=Sequential()

[43] model.add(Conv2D(32,(3,3),activation='relu',input_shape=(28,28,1)))

[44] model.add(MaxPool2D(2,2))

[45] model.add(Flatten())
     model.add(Dense(100,activation='relu'))

[46] model.add(Dense(10,activation='softmax'))
```

Question-5:

Compile The Model

Solution:

```
Compile The Model

model.compile(loss='sparse_categorical_crossentropy',optimizer='adam',metrics=['accuracy'])
```

Question-6:

Fit The Model

Solution:

Fit The Model

```
[48] model.fit(X_train,y_train,epochs=10)

Epoch 1/10
1875/1875 [==============================] - 36s 19ms/step - loss: 0.1610 - accuracy: 0.9523
Epoch 2/10
1875/1875 [==============================] - 35s 19ms/step - loss: 0.0557 - accuracy: 0.9826
Epoch 3/10
1875/1875 [==============================] - 35s 19ms/step - loss: 0.0381 - accuracy: 0.9877
Epoch 4/10
1875/1875 [==============================] - 35s 19ms/step - loss: 0.0264 - accuracy: 0.9915
Epoch 5/10
1875/1875 [==============================] - 38s 20ms/step - loss: 0.0181 - accuracy: 0.9939
Epoch 6/10
1875/1875 [==============================] - 36s 19ms/step - loss: 0.0131 - accuracy: 0.9956
Epoch 7/10
1875/1875 [==============================] - 34s 18ms/step - loss: 0.0096 - accuracy: 0.9968
Epoch 8/10
1875/1875 [==============================] - 34s 18ms/step - loss: 0.0081 - accuracy: 0.9973
Epoch 9/10
1875/1875 [==============================] - 34s 18ms/step - loss: 0.0054 - accuracy: 0.9982
Epoch 10/10
1875/1875 [==============================] - 34s 18ms/step - loss: 0.0063 - accuracy: 0.9980
<keras.callbacks.History at 0x7f376ba058d0>
```

Question-7:

Save The Model

- Test The Model

Solution:

Save The Model Test The Model

```
[63] model.evaluate(X_test,y_test)

313/313 [==============================] - 2s 6ms/step - loss: 0.0648 - accuracy: 0.9841
[0.06480585038661957, 0.9840999841690063]
```